APPENDIX F

METHODS OF PROTECTION OF GROUNDWATER DURING DRILLING AND ABANDONMENT OPERATIONS

Drilling

When processing an Application for Permit to Drill (APD), the BLM geologist must identify the maximum depth of usable water as defined in Onshore Oil and Gas Order #2. Usable water is water containing 10,000 parts per million or less of total dissolved solids. Water of this quality is to be protected by casing cemented in place over the water zone or by circulating cement up over the top of the water zone.

Determining the depth to fresh water requires specific water quality data in the proposed well vicinity or the use of electric logs from nearby wells. If water quality data or logs from nearby wells are not available, the area within a 2-mile radius of the proposed well is checked for water wells. If usable water is identified, surface casing is required to be set below the deepest fresh water zones found. In some cases, if the usable water is found at a depth that is too deep to set surface casing, the operator is required to circulate cement behind the production casing to a point high enough to isolate and protect the water zone.

Plugging and Abandonment of Wells

The purposes of plugging and abandoning (P&A) a well are (1) to prevent fluid migration between zones, (2) to protect minerals from damage, and (3) to restore the surface area. Each well must be handled individually due to a combination of factors, including geology, well design limitations, and specific rehabilitation concerns. Therefore, only minimum requirements can be established initially. These would be modified for the individual well.

The first step in the P&A process is filing the Notice of Intent to Abandon (NIA). The NIA must be filed and approved before plugging a well. Verbal plugging instructions can be given for plugging current drilling operations, but a Subsequent Report of Abandonment (SRA) must be filed after the work is completed. If usable fresh water is encountered while a well is being drilled, the BLM may assume responsibility for the well and the operator will be reimbursed for the attendant costs.

In open hole situations, cement plugs must extend at least 50 feet above and below zones (1) with fluid (oil, gas, water) which may migrate, (2) of lost circulation (this type of zone may require an alternate method to isolate), and (3) of potentially valuable minerals. Thick zones may be isolated using 100-foot plugs across the top and bottom of the zone. In the absence of productive zones and minerals, long sections of open hole may be plugged with 150-foot plugs placed every 2,500 feet. In cased holes, cement plugs must be placed opposite perforations and extending 50 feet above and below except where limited by plug back depth. It is also acceptable in cased holes to cement squeeze the perforations through a cement retainer placed above the perforations and leave approximately fifty feet of cement on top of the retainer.